

FORMULATION AND EVALUATION OF ASHWAGANDHA HERBAL GEL FOR ANTI-MICROBIAL AND ANTIFUNGAL ACTIVITY

Abhishek Borkar¹, Rameshwar Borkar², Dr Swati Deshmukh³

¹Shraddha institute of pharmacy kondala zambre washim, Maharashtra, India.

ABSTRACT

Approaches for studying antimicrobial susceptibility and discovering new antimicrobial agents from the plants and other natural sources have been extensively utilized. *Withania somnifera* (L.) Dunal, commonly known as Ashwagandha or Indian ginseng or winter cherry, is a popular medicinal plant in Ayurvedic medicine. The principal active compounds include several withanolide-type compounds. Various plant parts, like roots and less often leaves and fruits of Ashwagandha, have been used as plant-derived medicines. The plant exhibits a range of pharmacological properties, such as antibacterial activity. To evaluate the antimicrobial activity of extracts and purified compounds of different plant parts of ashwagandha, a wide variety of bacterial and fungal species have been employed as test microorganisms. Our goal in writing this article was to gather and analyze data regarding *W. somnifera*'s antimicrobial activity. The researchers will be able to choose plants, plant parts, solvent systems, test microorganisms, evaluation techniques, and other relevant elements that will impact the analysis on this platform. This will provide the platform for the researchers to select plants, plant parts, solvent system, test microorganisms, method of evaluation and other related factors affecting the analysis.

Keywords: Antibacterial activity, Antifungal activity, antimicrobial activity, Ashwagandha, *Withania somnifera*.

1. INTRODUCTION

Drugs can be successfully administered to the human body using a variety of methods, such as oral, sublingual, rectal, parental, cutaneous, inward breath, and more, to treat illnesses. Skin conveyance can be defined as the application of a medication containing specific details to the skin in order to directly treat cutaneous issues like skin breakouts or the cutaneous symptoms of an underlying illness like psoriasis with the goal of limiting the medication's pharmacological or other effects to the skin's outer layer or inside the skin. Even with the use of froths, splash, drugged powders, arrangements, and, surprisingly, cured glue frameworks, semi-strong plans in all their forms outperform the framework for effective delivery. Definitions of skin. Skin definitions are probably among the most difficult elements to design since they describe how a drug is delivered to a specific location. In order to accommodate varied combinations that may have different, if not opposing, physicochemical properties, a practical effective detailed must provide a stable synthetic environment in a reasonable distribution holder. When applied, an effective definition should interact with the skin's temperature since this might influence the speed at which the structures arrive to accomplish sufficient skin absorption. 1. Medication used topically provides a potent and targeted therapy for associated dermatological diseases. Due to its ability to circumvent the first-pass effects, gastrointestinal distress, and metabolic deterioration associated with oral organization, this mode of drug delivery has become more and more common. Only 25–45% of the oral portion that is delivered enters the blood stream because of the primary prior impact. The gel definitions, which were suggested as an application, can help prevent these unfavorable opinions.. Because they are less greasy and can be easily removed from the skin, effective gel formulations provide suitable delivery equipment for tablets. All things considered, Gels envelop stage device wherein inorganic waste are not disintegrated anyway essentially scattered all throughout the constant segment and large natural flotsam and jetsam are broken down in the persistent stage, haphazardly.

Is and other antimicrobial agents, such as thin-layer chromatography (TLC), the agar disk-diffusion technique, the antimicrobial gradient method, the method of diffusion on agar wells, the agar plug diffusion method, the cross-stitch method, and the poisonous food method

bioautography (agar diffusion, direct bioautography, agar overlay bioassay), dilution methods (broth dilution method, [2] CODEN (USA): JDDTAO Ktion method), time-kill test (time-kill curve), ATP bioluminescence assay, flow cytometric method³A pure compound's or a plant extract's in vitro antimicrobial activity can be screened or assessed using a range of scientific techniques. The widely used and basic methods are the disk/disc diffusion method and broth/agar dilution methods. Other techniques, such as the poisoned food methodology, are specifically employed to test the antifungal activity¹¹ To further study the antimicrobial effect of an agent in depth, Time-kill test and flow cytometric methods are endorsed for further in-depth study of the effect. Various methods are used for the assessment of the antimicrobial potential of plant extracts, essential of antimicrobial agents, which provide details on the nature of the inhibitory effect (bacteriostatic or bactericidal) (concentration-dependent time-dependent) and the test microorganism's cell damage

ASHWAGANDHA: AN IMPORTANT MEDICINAL PLANT

Withania somniferous (L.) Dunal, commonly known as Ashwagandha or Indian ginseng or winter cherry, is a renowned medicinal plant in Ayurvedic medicine¹². The principal active compounds include several withanolide-type compounds^{13,14}. Due to the non-hazardous and great medicinal value, it is commonly used all over the world. Roots, and less often leaves and fruits, have been used as phytomedicines in the form of decoction, infusions, ointment, powder, and syrup¹³⁻¹⁵. These days, it is cultivated as a crop to maintain the high demand of biomass and a sustainable eminence for the requirements of pharmaceutical industry¹⁶. For more than 3,000 years, ashwagandha has been a significant herb in Ayurvedic and traditional medicinal systems.. It belongs to the family Solanaceae and possess a chromosome number CHEMICAL CONSTITUENTS Journal of Drug Delivery & Therapeutics. 2019; 9(5-s):154-161 of $2n=48$. In the India, only two species of *Withania* are found which includes *W. somniferous* and *W. coagulans*¹⁷. In India and many other countries of the world, this plant has been utilized as a home cure for a variety of illnesses.. It is found in the wild form in many parts of the India and in the Mediterranean region of North Africa. In the India, it is grown in Rajasthan, Madhya Pradesh, Himachal Pradesh, Punjab and Uttar Pradesh¹⁷. In traditional Indian medicine, it is referred to as "Indian ginseng" and is listed in the Vedas as a herbal tonic and nutritious meal.. It is utilized as a liver tonic, anti-inflammatory, antioxidant, antimicrobial agent and cure for asthma¹⁸. Withaferin-A has been receiving a good deal of attention because of its antibiotic and antitumor activity¹⁹. In Unani system of medicine, roots of *W. somniferous* usually known as Sagan are utilized for the medicinal properties²⁰ According to Ayurveda, ashwagandha has potent aphrodisiac, revitalizing, and life-extending qualities.. It has overall animating and regenerative abilities It is used, among other things, to treat coughing, skin concerns, memory-related disorders, nervous weariness, sleeplessness, and tiredness potency difficulties., tiredness potency issues and coughing. It also increases learning capability and memory capacity. Traditionally, ashwagandha was used to boost vitality, youthful vigor, strength, endurance, and health; it was also used to foster the body's time elements, including muscle fat, lymph, blood, and cells.. It helps counteract chronic fatigue, dehydration, weakness, loose teeth, bone weakness, impotency, thirst, premature aging emaciation, muscle tension, debility and convalescence It helps to revitalize the reproductive organs, which is similar to how feeding a tree's roots can revive the tree.²¹.

PHARMACOLOGICAL ACTIVITIES OF ASHWAGANDHA

W. somniferous possesses various pharmacological activities (Figure 2) viz., anti-inflammatory activity, antibacterial activity, antifungal activity, antiviral activity, antitumour activity, immunomodulatory stress/adaptogenic activity, activity, anticonvulsant anti-activity, neuropharmacological activity, Musculo tropic activity, Antioxidant action, anti-aging impact, anti-hyperglycemic effect, activation of macrophages, hepatoprotective effect, tolerance to morphine, and inhibition of dependent Twenty.

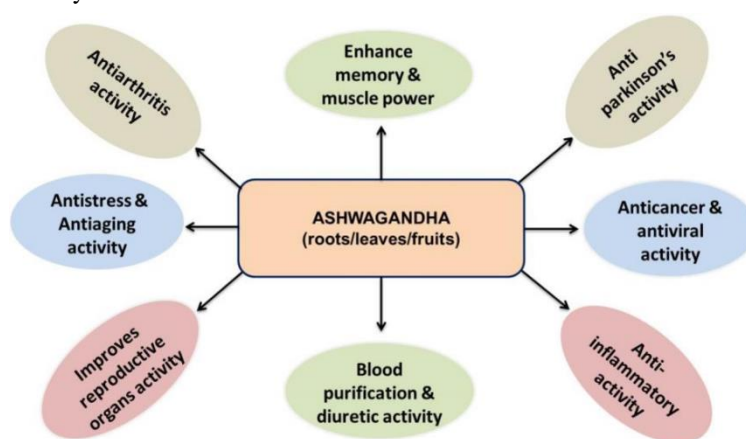


Fig no 1 pharmacological activity of ashwagandha

Antibacterial activity of Ashwagandha

Many bacterial species have been used as a test microorganism for the assessment of the antimicrobial activity of extracts and purified compounds of *W. somnifera*. These bacterial strains included *Citrobacter freundii*, *Enterobacter aerogens*, *Enterococcus faecalis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Acinetobacter baylyi*, *Aerobacterium tumefaciens*, *Bacillus cereus*, *Bacillus subtilis*, *Bacillus thuringiensis*, *Chlamydomypha pneumonia*, and *Citrobacter freundii*, Resistance to Methicillin *Proteus mirabilis*, *Proteus solanacearum*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *Raoultella planticola*, *Salmonella typhi*, *Salmonella typhimurium*, *Serratia marcescens*, *Micrococcus luteus*, *Neisseria gonorrhea*, and *Staphylococcus aureus* *Xanthomonas axonopodis* pv. *malvacearum*, *Yersinia enterocolitica* and few others. The comprehensive gathering of data pertaining to antimicrobial activity

Antifungal activity of Ashwagandha

In the past, antifungal activity has been evaluated for various extracts of different plant parts of Ashwagandha. The detailed information on the antifungal activity of Ashwagandha is Many test fungal species including, *Alternaria brassica*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Aspergillus niger*, *Aspergillus oryzae*, *Candida albicans*, *Candida kefyr*, *Candida tropicalis*, *Cryptococcus neoformans*, *Dreschlera turcica*, *Fusarium oxysporum* f. sp. *cepae*, *Fusarium oxysporum*, *Fusarium verticilloides*, *Penicillium chrysogenum*, *Penicillium citrinum* and *Trichoderma viridae* were used for the assessment of the antifungal activity of Ashwagandha. Several plant components, including the calyx, flower, fruits, leaves, root, and stem, were employed to evaluate the antifungal activity. The most commonly utilized plant portion was the ashwagandha root. The extraction process included a variety of solvents, including acetone, benzene, chloroform, ethanol, ethyl acetate, glacial acetic acid, hexane, isopropanol, methanol, petroleum ether, toluene, and hot and cold water. However, agar well diffusion method and poison food technique were also used for the evaluation. Some common concerns must be established to evaluate the antimicrobial activity of plant extracts, essential oils and the isolated/extracted compounds from them. The most important aspects are those that define and characterize common elements, including the test microorganisms examined, the growth medium utilized, the techniques used, and the plant sections used (Rios and Recio, 2005). When choosing and gathering plant resources, systematic guidelines have to be followed. Furthermore, the choice of plants and plant components should be based on an ethnopharmacological perspective to prevent needless exercise. The study's ultimate result might be changed by the solvent systems and the extraction process. The solvent systems and the extraction procedure may alter the final outcome of the study.

2. CONCLUSION

Ashwagandha (*W. somnifera*) owns a tremendous amount of medicinal properties including antimicrobial activity. Many test microorganisms have been used for the assessment of the antimicrobial activity of extracts and purified compounds of various plant parts of Ashwagandha. Still, there are many scopes of the research or the identification and isolation of antimicrobial agents from Ashwagandha. The information provided in this article will provide the platform for the researchers to select plants, plant parts, solvent system, test microorganisms, method of evaluation and other related factors affecting the analysis

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